



# An Insight into EGIP and the Winchburgh Tunnel Blockade



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# Paul Reilly (Programme Manager)

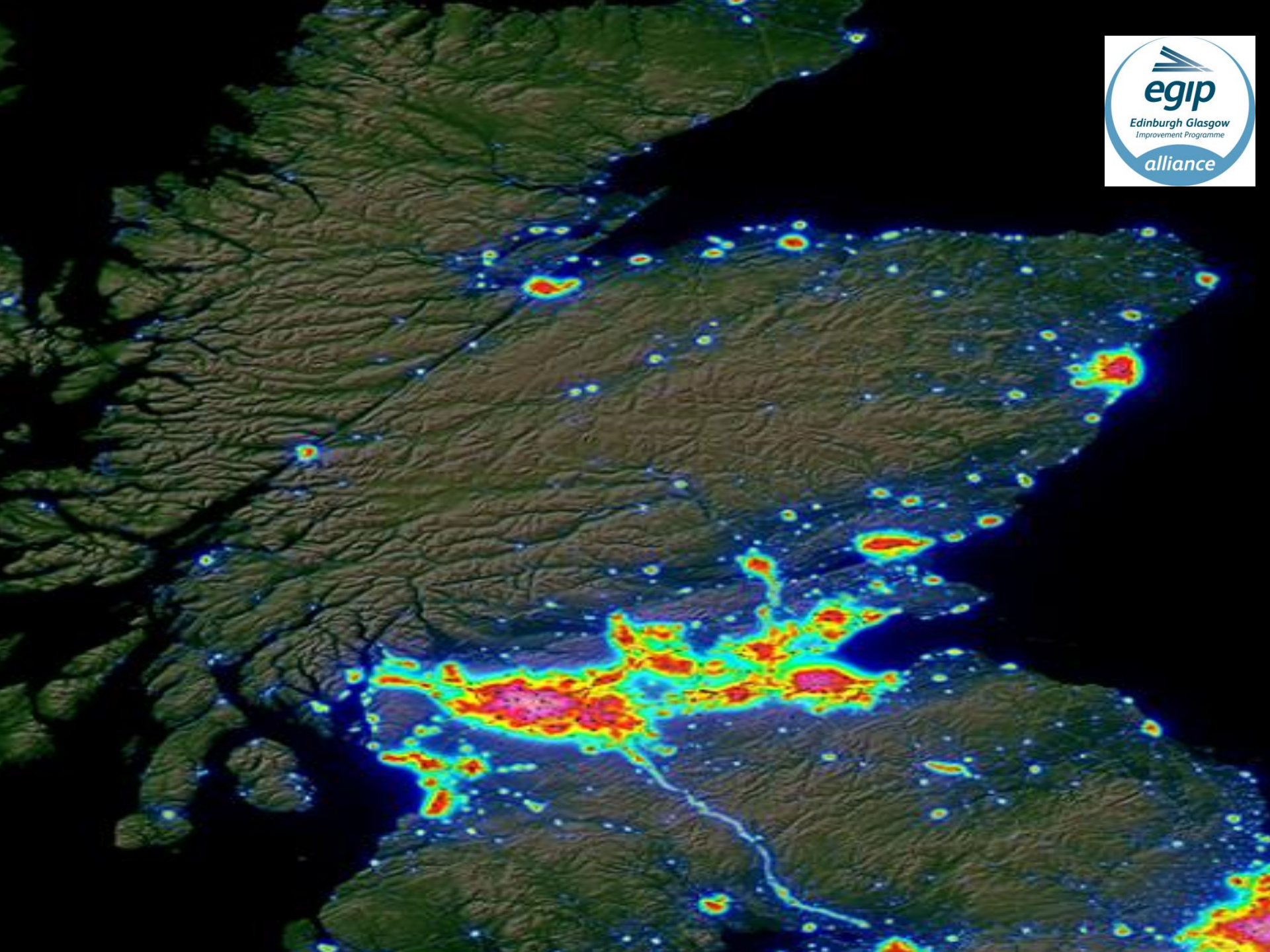
- 25 years experience in the rail sector,
- Experience - Structural Assessment, Contract Management, Project Managing Plain Line and Switch & Crossing renewals and Programme Controls,
- A programme manager on EGIP since July 2013
- Currently working on Anniesland Connecting Line and Queen Street Infrastructure Works



# An Introduction to EGIP









# EGIP Overview

- A comprehensive package of improvements to Scotland's railway infrastructure,
- A Scottish Government priority, £742m Investment
- Electrification of the main line between Edinburgh and Glasgow and to Stirling, Dunblane and Alloa
- 150 single track km of new electrified railway, parapet works, bridge works, platform extensions.



# EGIP Timeline

## Key output 1 - Initial Works to Improvement Programme

### Overhead Electrification works

- RC and piled foundations
- Structures
- Wiring
- Power Distribution

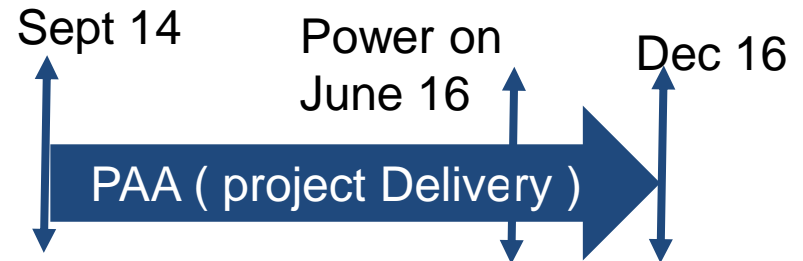
– Initial E&G EMU service with a 50 minute journey time and 7-car maximum train length.

### Major Civil Elements

- Glasgow Queen Street Station remodelling
- Winchburgh Tunnel
- Edinburgh Waverley remodelling (smaller scope)
- Millerhill Depot
- Route wide Civils

### Subsidiary Infrastructure Works

- Bridge Works – Remedials to Replacement
- Station Improvements





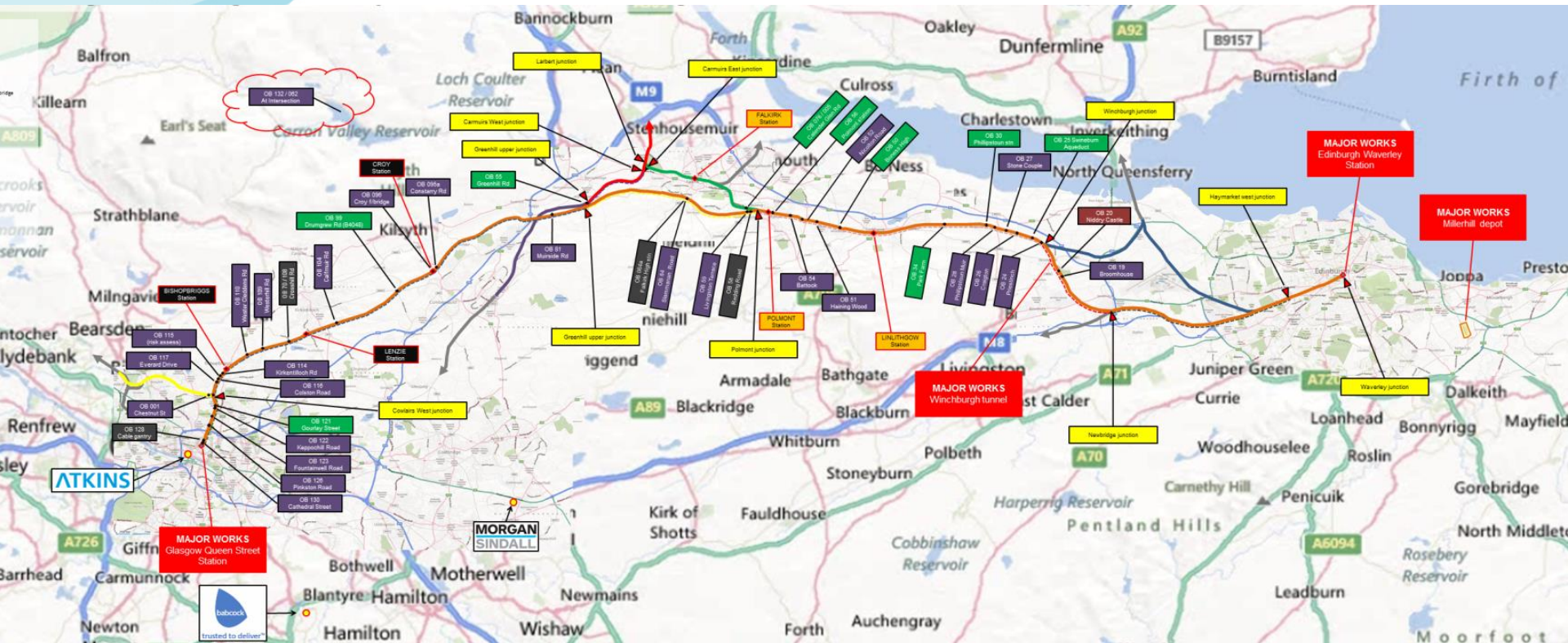
# The Alliance

and sub-alliance partners





# EGIP Civils Works



36 X Parapet Modifications



4 X 'Major Works'



4 X Platform Lengthening



10 X Bridge Works  
(2 Demolitions and 8 re-builds)





# Winchburgh Tunnel Project Overview

- Opened in 1842,
- 338m long,
- 2 years to build,
- 200,000 tonnes more rock.





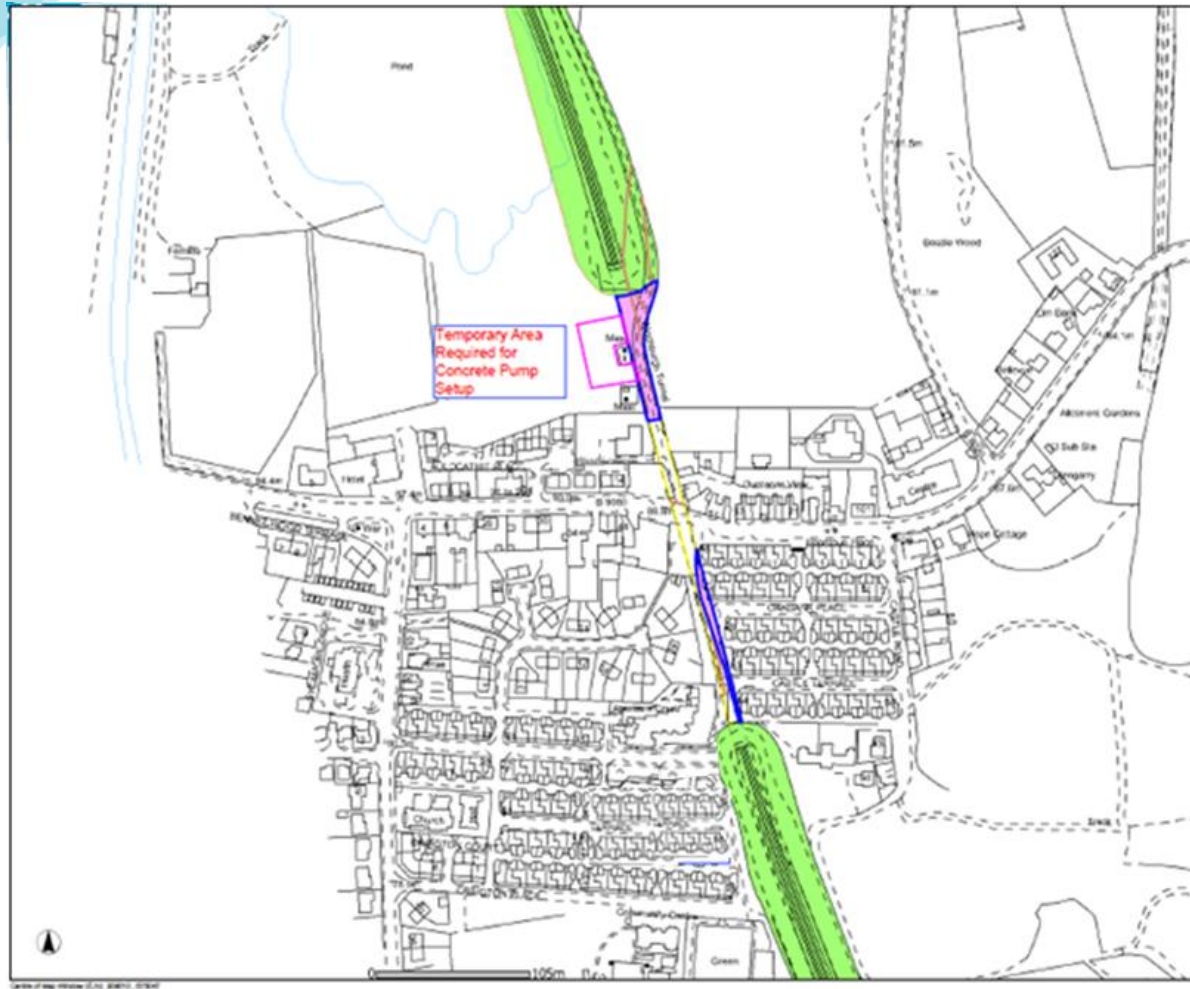
# Scope of works

- Why? Route Clearance for electrification,
- Installation of **936m of OBB PORR slab track** through Winchburgh Tunnel to achieve electrical clearances,
- This consisted of: **Rock removal = 400m<sup>3</sup>, Spoil removal = 2000m<sup>3</sup>, Concrete poured = 1200m<sup>3</sup>,**
- Associated drainage works, installation of 825m of drainage,
- Installation of OLE Conductor Beam supports,
- Tunnel lining repairs.





# Winchburgh Map



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## WINCHBURGH TUNNEL

Plot Scale	1:2500
Plot Date	25/2/2014



Output Created from the Data Portal - All Landmarks





# Workforce and shift patterns

- Continuous 24 hour 44 day worksite activity,
- Three eight hour shift pattern,
- On average 75 individuals per shift, 225 per day,
- Over 950 different individuals on site throughout the blockade,
- Over 80,000 man-hours of work.



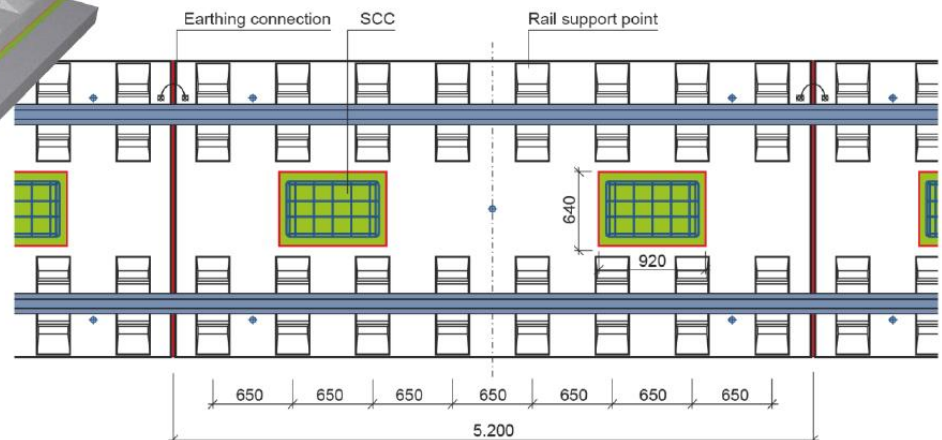
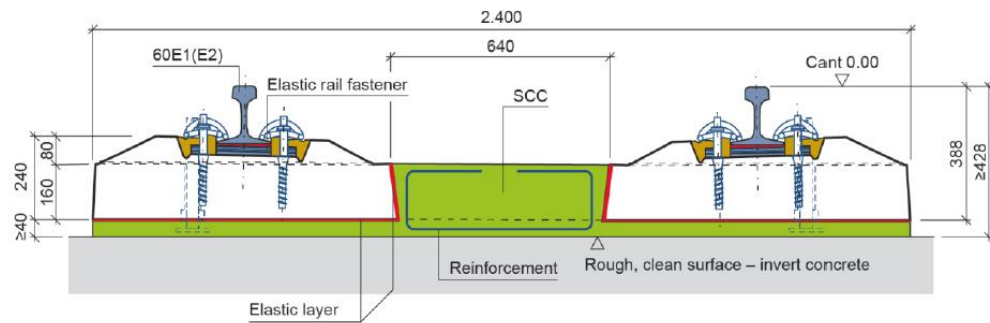
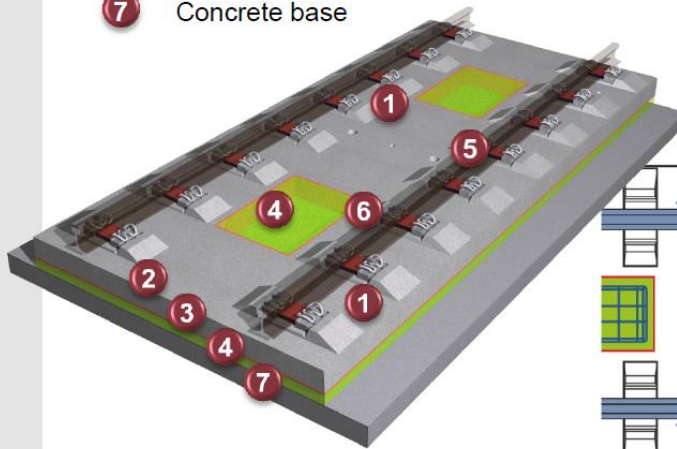
# Why OBB PORR Slab Track System?

- High Fixity
- Ease of installation
- Ease of maintainability
- Proven track record



# OBB PORR Schematic

- 1 Holes for spindles
- 2 ÖBB-PORR slab
- 3 Elastomeric layer
- 4 Self-compacting concrete (SCC)
- 5 Rail support point
- 6 Long rail
- 7 Concrete base





# Long term performance



FJB Wien – Gmünd  
area Langenlebarn

1989

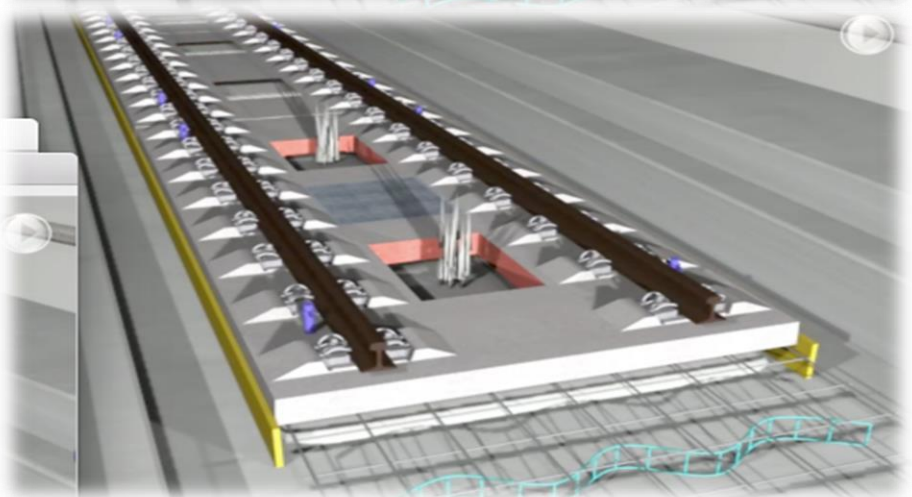
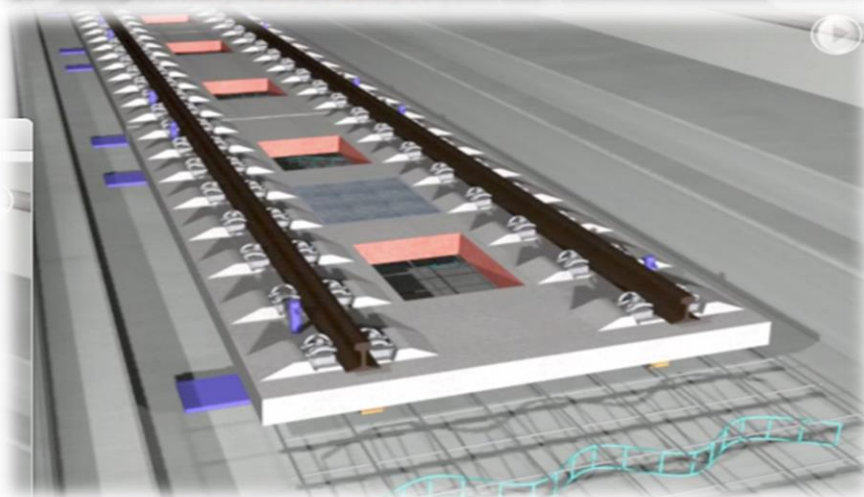
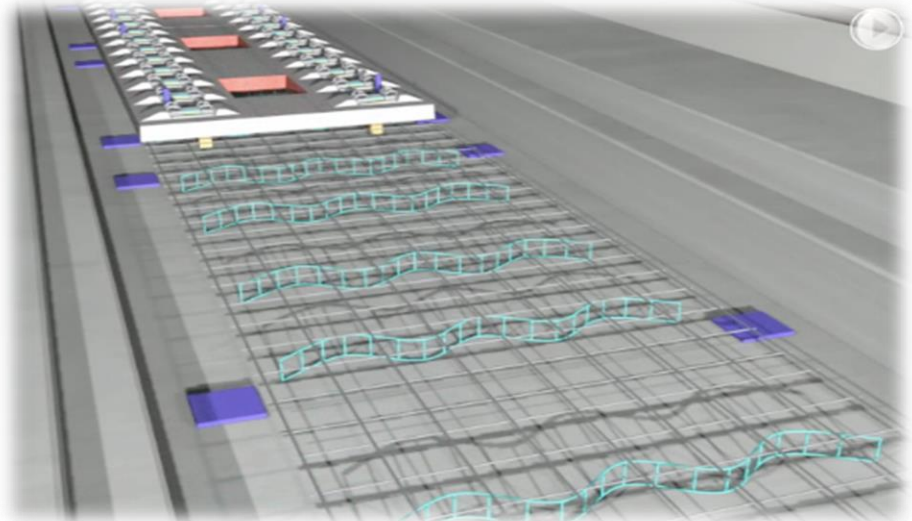
Slab track ÖBB-PÖR

Embankment

264 m



# Ease of Installation





# Panel Delivery

- Panels delivered by truck to Leith Docks (DBS Yard) direct from Austria (4 day journey),
- 4 panels per wagon = 46 truck loads,
- Salmon wagons delivered to site,
- Panels loaded on Salmons for Up road,
- Train arrives on UP road for unloading and placing of panels,
- Exercise repeated for Down road.











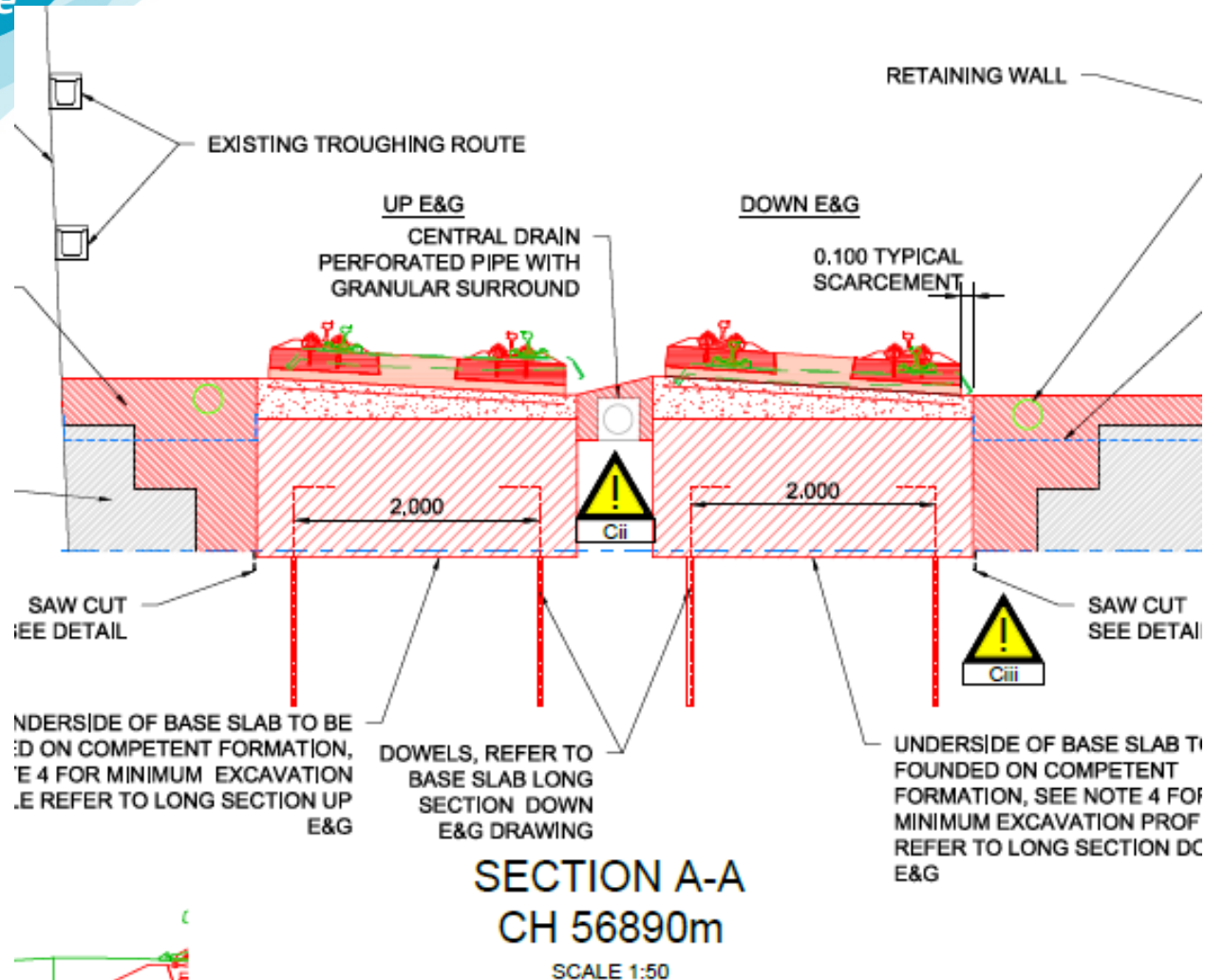




# Rock Excavation

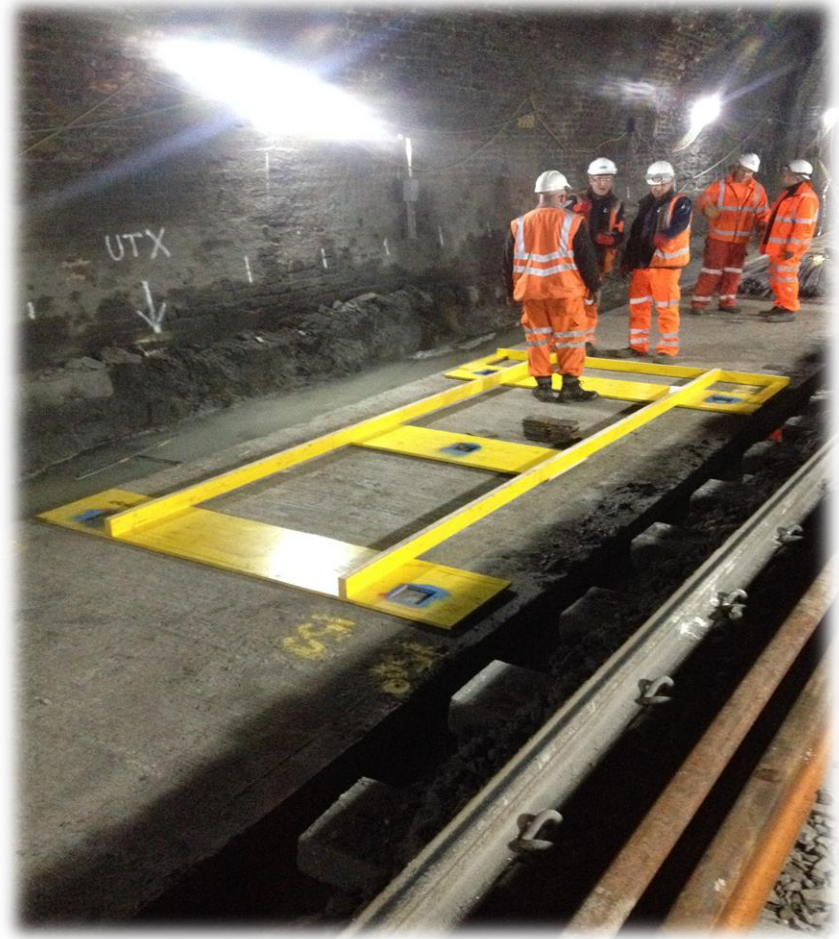


# Installation of Dowels





# Base Slab Construction





# Slab Installation





# Rail Installation

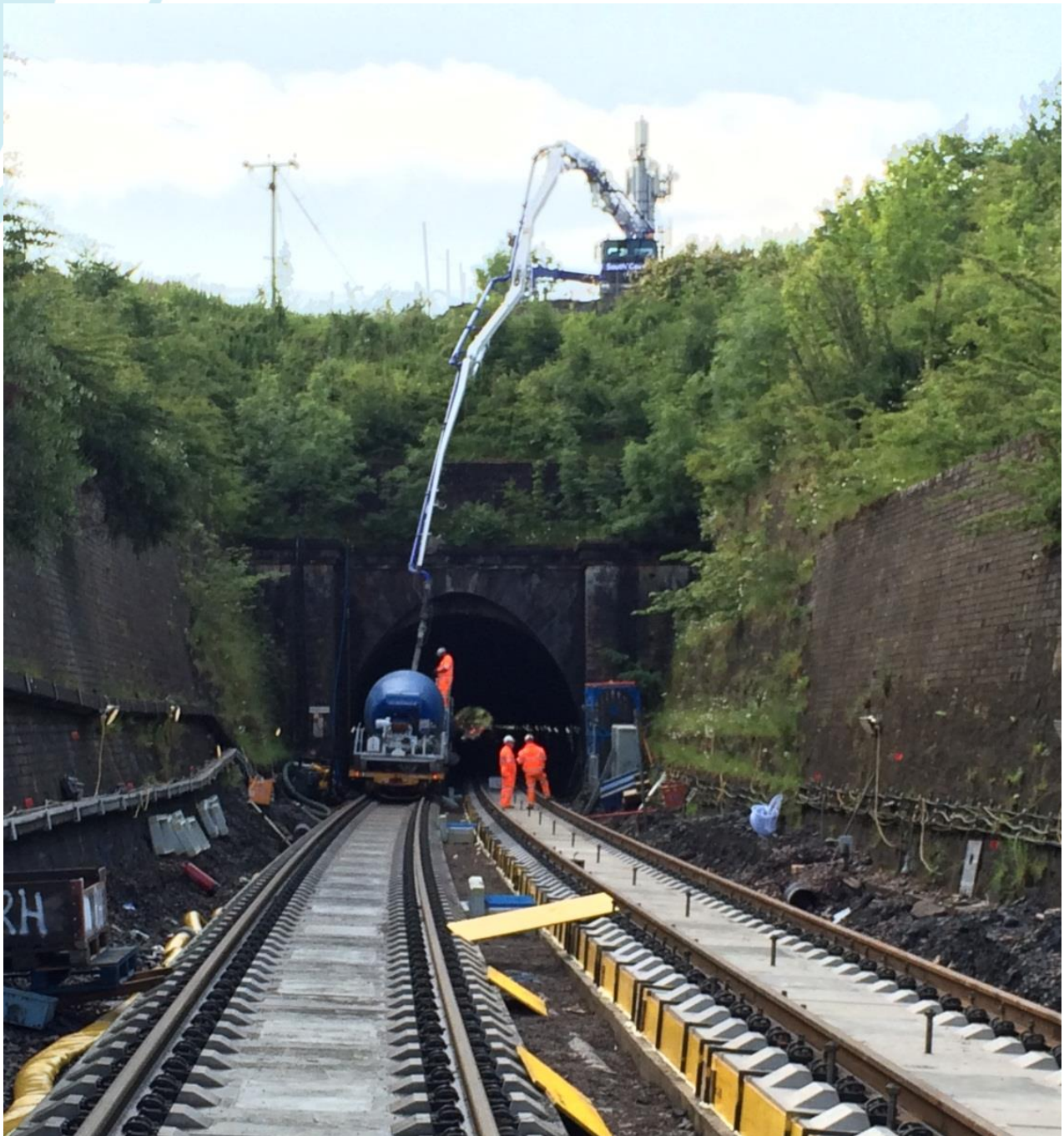




# SCC – Self Compacting Concrete

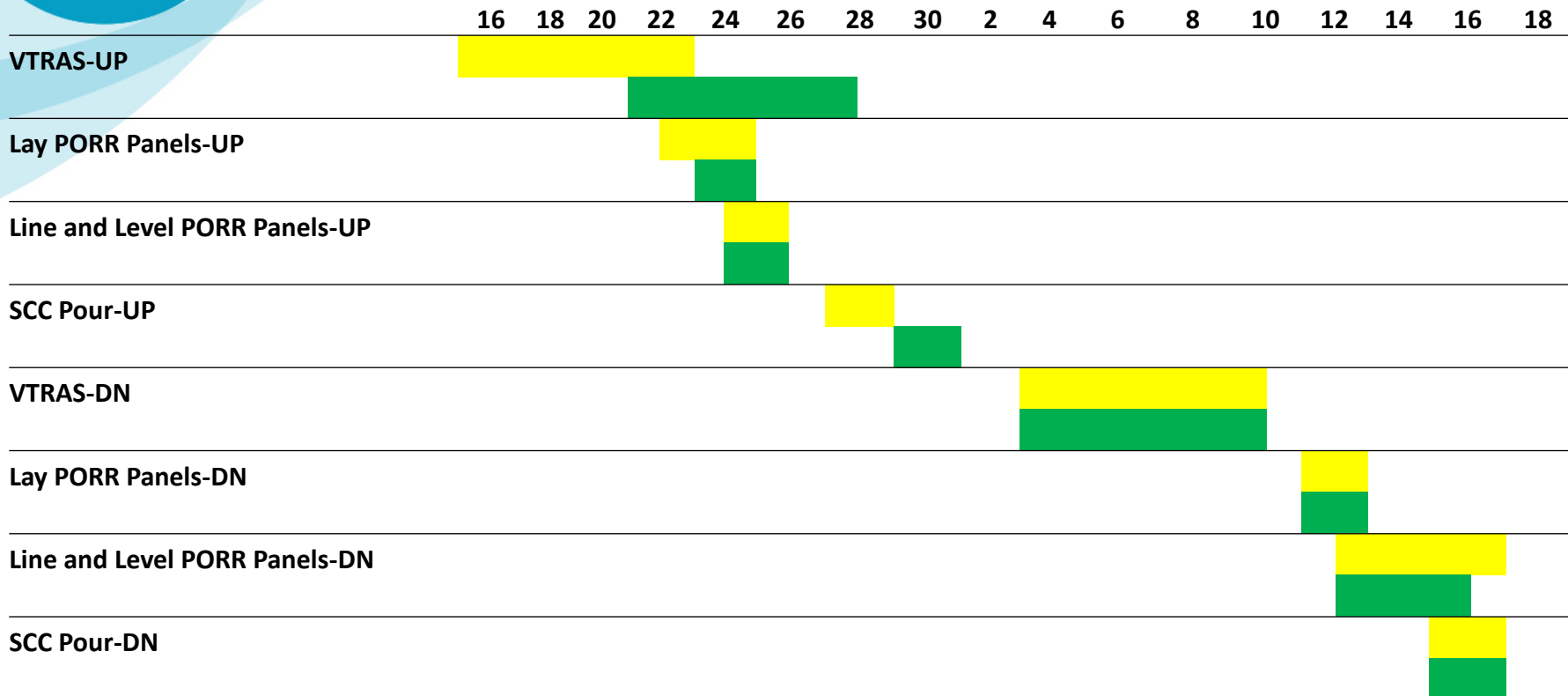
- SCC took 3 months of testing and trials to get correct specification,
- Concrete supplied by Hope Construction and was continuously poured,
- Concrete supplier providing concrete in road mixer every 30 mins initially, but reduced to 20 mins on Down Road,
- Supplied in 5 M<sup>3</sup> loads; 34 Nr loads in total,
- Each load factory tested and site tested for flow/slump and etc.
- Each load delivered to concrete pump on Glasgow portal,
- Unloaded via pump into road/rail concrete mixer.







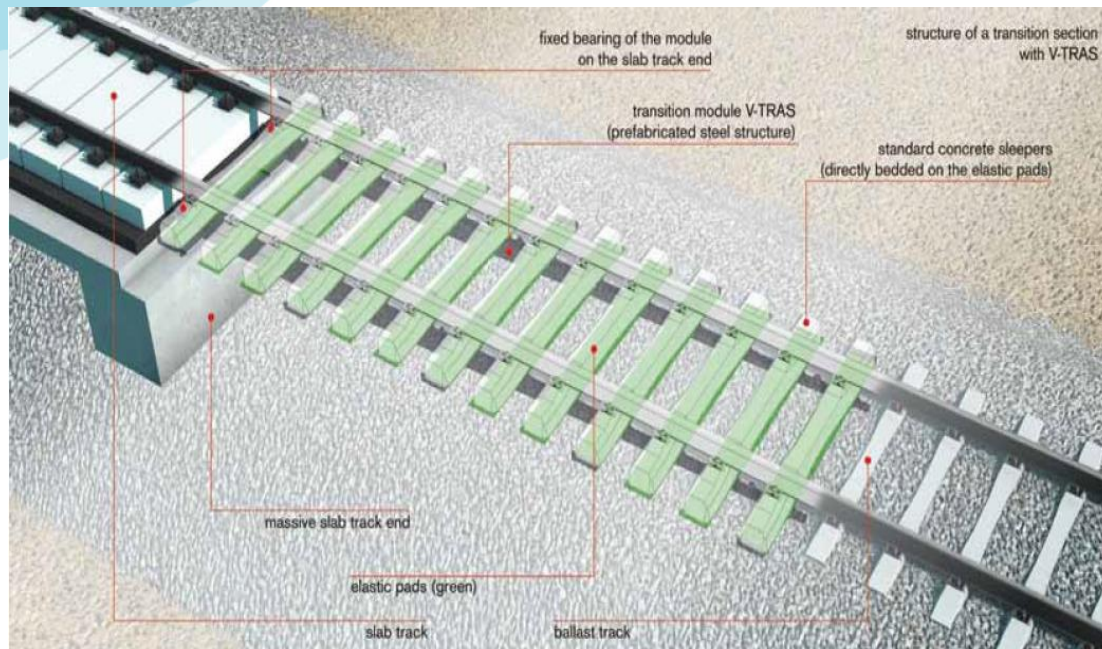
# Slab Installation Programme



Planned

Actual

# V-TRAS



- Acts as a transition ramp between slab and conventional track,
- One side sits on the end of the slab, the rest of the module is placed in the ballast, which provides a floating support,
- Conventional sleepers sit on this structure,
- The top surface of module has elastic bearings at the points in contact with the sleepers,
- It is completely embedded in the ballast below the sleepers and integrated into the track superstructure.





# V-TRAS



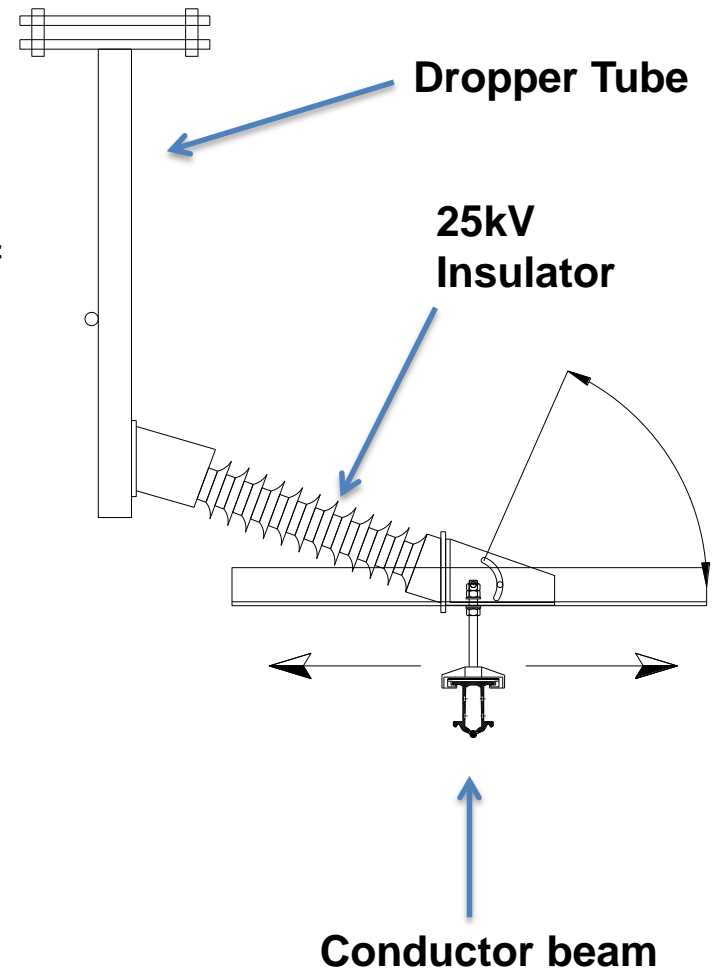


# Slab Track Installation

- Main panels – 5.16m long x 2.4m wide x 160 thick @ 5 Tons each
- 184 panels in total = 910 tons
- 8 Nr half panels (at transitions)
- 100 Nr straights
- 48 Nr Medium radius
- 28 Nr Large radius
- 4 Nr Vtras units
- Total length relaid = 936m
- Volume of SCC laid = 170m<sup>3</sup>

- Catenary Structures will be protected against electrical shock through the use of bonding system to the earthing wire,
- The Conductor Beam in the tunnel shall consist of an aluminium alloy extruded beams, a cross-sectional area of 2200mm<sup>2</sup> and a copper equivalent cross-sectional area no less than 1150mm<sup>2</sup> housing a 120mm<sup>2</sup> contact wire.

# Conductor Bar





# Challenges



# Challenges – Water Management

## Drainage

- Not all drainage completed in advance
- Water ingress from Winchburgh pond
- Overpumping required, continued maintenance and management of pumps





# Challenges – Rock Removal

## **Dolerite:**

- A mafic, holocrystalline, subvolcanic rock,
- Hard to remove and control extent of excavation,
- Preparation of formation for Geotechnical acceptance,
- **Rock wheels and hydraulic breakers.**

## **Mudstone:**

- A fine grained sedimentary rock whose original constituents were clays or muds,
- Large Quantities, readily degraded by water,
- **Water management, surface prep using air lance.**





# Contingency

- 66hrs clear contingency in programme
- 50hrs of sacrificial activities – OLE conductor bar fixings
- Hold point following Upline installation to allow early dialogue with TOCs if any risk to 27/7 blockade handback





# Successes and Lessons Learned

Constructive collaborative review identified over 170 lessons learned and 50 successes



# Key Lessons Learned

1. Compound - Size, layout, facilities, management etc. was not appropriate/efficient for nature of project,
2. Dowels – Installation methodology was time consuming, changed for Down line,
3. Preparation of the rock surface was problematic, more time and resource built into future programmes,
4. Water management on site was not adequate, drainage installed in advance.







# Key Successes

1. Delivered works within the blockade timeframe,
2. Delivered safely – Accidents were minimal despite the number of staff on site over a 6 week period of 24 hour working,
3. Project team pulled together well offering commitment and flexibility by a lot of people to get the job back on programme after the difficulties experienced at the start,
4. Public interface with locals. Good feedback all round when in village, very few complaints and any issues were dealt with quickly.





# Looking forward to Queen Street

- Apply lessons learned and successes from Winchburgh,
- Water management – early intervention,
- Geological conditions more favourable,
- Challenges: Constrained site access, interface with track renewals, staff motivation (4 months).



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ANNE TO  
SERVICE TROUGH

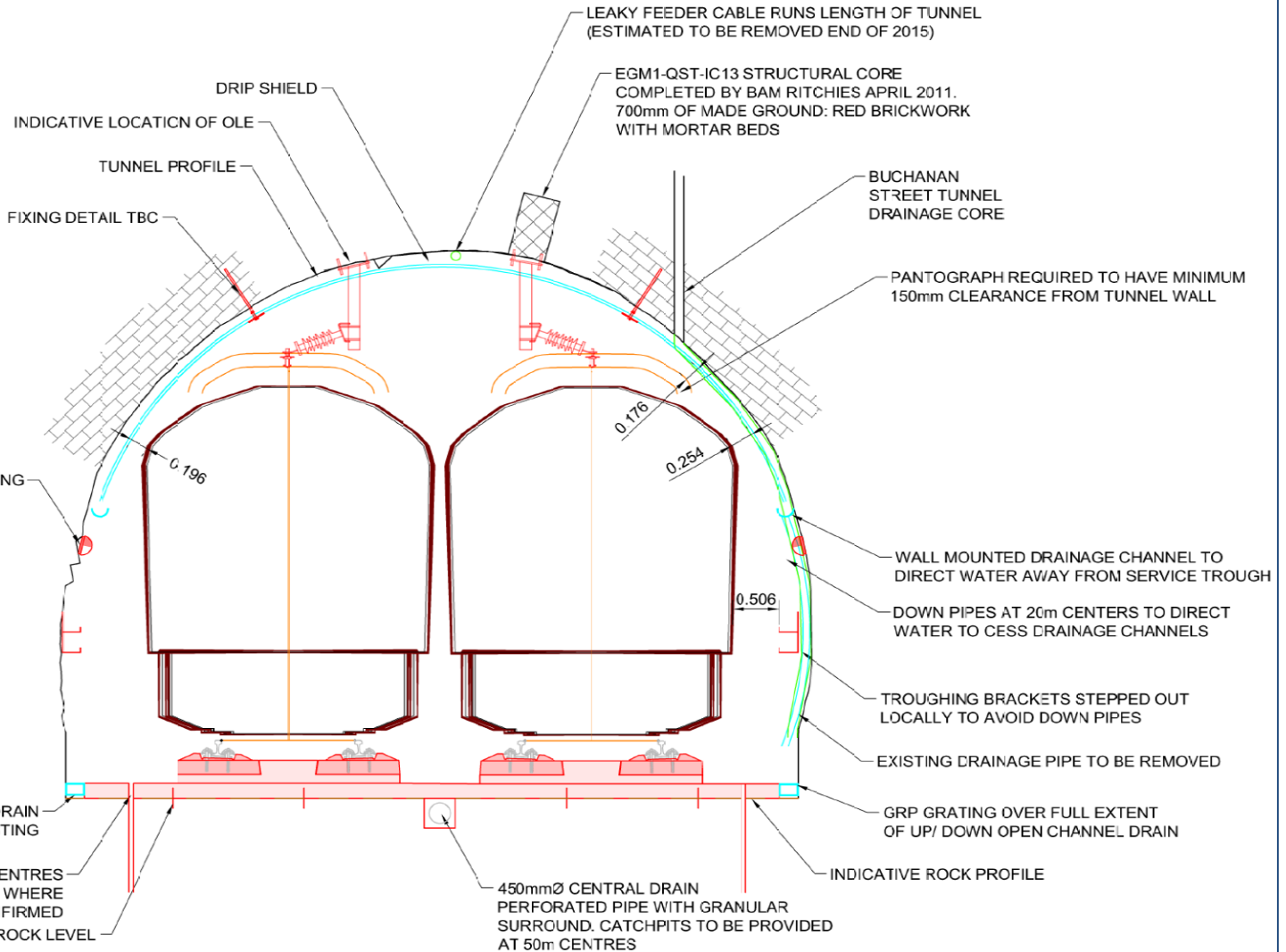
TO DIRECT  
CHANNELS

D OUT

T OF

75mmØ PRESSURE RELIEF PIPE AT 5m CENTRES  
TO DEAL WITH ARTESIAN WATER WHERE  
REQUIRED - TO BE CONFIRMED  
DOWELS FROM BASE SLAB TO ROCK LEVEL

OPEN CHANNEL DRAIN  
TO BE AS EXISTING



## SECTION @ TUNNEL CHAINAGE 590m (BRICK LINED)

SCALE 1:50

## Commuters face more misery after tunnel completion



news

\$ with  
work

Glasgow 19.5°C

HAVE YOUR SAY

COMMUTERS looking forward to the end of six weeks' disruption on Scotland's busiest rail line tomorrow face the prospect of more to come next year.

A £17 million upgrading of the Winchburgh tunnel on the main Edinburgh-Glasgow route will finish on time and budget, the ScotRail Alliance, which includes Network Rail, announced yesterday.



# Winchburgh rail tunnel works completed on time



ScotRail Alliance managing director Phil Verster and transport minister Derek McKay at the entrance to Winchburgh tunnel



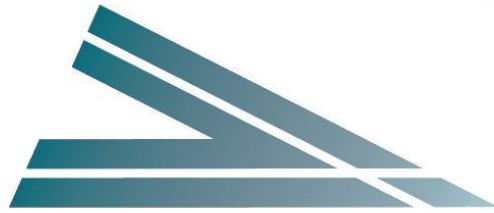


# Winchburgh Tunnel Summary

- Track lowering to accommodate electrification of the main Edinburgh to Glasgow Line,
- First slab track of its type to be installed in the UK operational infrastructure,
- 44 day blockade delivered on time and on budget by the EGIP Alliance.



# Any Questions?



***egip***

***Edinburgh Glasgow***  
*Improvement Programme*

***alliance***